1. Scope
1.1 This specification describes the requirements for an incremental modular encoder with the optional encoders around index pulse, commutation signals, and open collector differential line outputs.

2. Mechanical Specifications
2.1 See Figure 1.
2.2 Mounting requirements see Figure 2.
2.3 Mounting screw (Thread lock is recommended).
2.3.1 M3.5 Mounting Screw 10-20 oz-in
2.3.2 M3 Set Screw DIN96 100 10 oz-in max.
2.3.3 #2-56 Mounting Screw 10-20 oz-in
2.4 Termination see Table 1.
2.5 Hub bore sizing see Table 2.
2.6 Allowable轴 end play 0.010.
2.7 Stiffness weight 1.0 ozk 126 pl.
2.8 Hub Material: 400 series stainless steel, (ROHS Compliant).
2.9 Magnet Material: Nitrile Bonded Ferrite.
2.10 Moment of Inertia see Table 2.
2.11 Vibration Specification: 30-20000 Hz.
2.12 Rotational adjustment of alignment 30°.

3. Electrical Specifications
3.1 Code: Incremental with commutation and open index pulse marker.
3.2 Counts per revolution see Table 3.
3.3 Supply Voltage: 3.3.1 Single 5.0V ±0.5V.
3.4 Current see Table 1.
3.5 Output Formats: See Figure 1.
3.5.1 Output Format: Logic Levels:
- 3.5.1.1 Logic “1” 2.5 VDC Min.
- 3.5.1.2 Logic “0” 0.5 VDC Max.
3.5.2 Output Type:
- 3.5.2.0 Line Driver: 20mA Sink/Source
- 3.5.2.2 Open Collector: 10mA Source
3.5.3 Output Format commutation: See Figure 1.
3.5.3.1 1/2 = 4 Pole Motor = 2 Commutation Cycles/360°
3.5.3.2 1/4 = 4 Pole Motor = 2 Commutation Cycles/360°
3.5.3.3 1/8 = 6 Pole Motor = 3 Commutation Cycles/360°
3.5.4 Output Logic Levels:
- 3.5.4.0 Logic “1” 2.5 VDC Min.
- 3.5.4.2 Logic “0” 0.5 VDC Max.
3.5.5 Output Type:
- 3.5.5.1 Line Driver: 20mA Sink/Source, 24VDC
- 3.5.5.2 Open Collector: 10mA Source, 24VDC
3.6 Operating RPM: 3.6.1 10,000 RPM MAX.

4. Environmental Specifications
4.1 Operation Temperature:
- 4.1.1 DC = -40°C to 85°C (125°C with Open Collector)
- 4.1.2 DC = -40°C to 125°C Non-Line Driver
4.2 Storage Temperature:
- 4.2.1 -55°C to 125°C
4.3 Humidity: 85% Relative (Non-Condensing)
4.4 IP Rating: IP40 with cover.

**Table 1 - Cable/Pin Functions**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP 1</td>
<td>A+</td>
<td>A+</td>
</tr>
<tr>
<td>TP 2</td>
<td>A-</td>
<td>A+</td>
</tr>
<tr>
<td>TP 3</td>
<td>B+</td>
<td>B+</td>
</tr>
<tr>
<td>TP 4</td>
<td>B+</td>
<td>B+</td>
</tr>
<tr>
<td>TP 5</td>
<td>C+</td>
<td>C+</td>
</tr>
<tr>
<td>TP 6</td>
<td>C+</td>
<td>C+</td>
</tr>
<tr>
<td>TP 7</td>
<td>D+</td>
<td>D+</td>
</tr>
<tr>
<td>TP 8</td>
<td>D+</td>
<td>D+</td>
</tr>
<tr>
<td>TP 9</td>
<td>V+</td>
<td>V+</td>
</tr>
<tr>
<td>TP 10</td>
<td>V+</td>
<td>V+</td>
</tr>
<tr>
<td>TP 11</td>
<td>W+</td>
<td>W+</td>
</tr>
</tbody>
</table>

**Figure 1**
AF ALIGNMENT OF INDEX PULSE & RISING EDGE OF "A" COMMUTATION SIGNAL

**Figure 2**
ALIGNED VIEWING ENCODER TOP

**Figure 3**
U, V, W OUTPUTS

**Figure 4**
MODULAR ENCODER SPECIFICATIONS SHEET MODEL TM615

**Figure 5**
THE TIMKEN COMPANY

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**Table 2**

<table>
<thead>
<tr>
<th>Hub Size</th>
<th>Hub ID Tolerance</th>
<th>Shaft Size with Hub ID</th>
<th>Hub Size with Hole ID</th>
<th>Moment of Inertia ee-6 in^2/sec^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8</td>
<td>0.1250 ± 0.0004</td>
<td>0.1250 ± 0.1254</td>
<td>0.1250 ± 0.1256</td>
<td>0.1193</td>
</tr>
<tr>
<td>3/16</td>
<td>0.1675 ± 0.0004</td>
<td>0.1675 ± 0.1681</td>
<td>0.1675 ± 0.1870</td>
<td>0.1756</td>
</tr>
<tr>
<td>5 mm</td>
<td>0.1968 ± 0.0004</td>
<td>0.1968 ± 0.1974</td>
<td>0.1968 ± 0.1983</td>
<td>0.1884</td>
</tr>
</tbody>
</table>

**Table 3**

<table>
<thead>
<tr>
<th>Resolutions</th>
<th>Commutation</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0.0005</td>
</tr>
<tr>
<td>400</td>
<td>0.0010</td>
</tr>
<tr>
<td>640</td>
<td>0.0015</td>
</tr>
<tr>
<td>1000</td>
<td>0.0020</td>
</tr>
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<td>2000</td>
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<tr>
<td>4000</td>
<td>0.0060</td>
</tr>
<tr>
<td>8000</td>
<td>0.0120</td>
</tr>
</tbody>
</table>

**Figure 6**
USF 2.5 X 4MM LONG SNAP #2-56 WITH CAPITATIVE WASHERS

**Figure 7**
1.0000 INCH

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Some parts of the document may not be fully legible or may require additional context for full comprehension.